B' cont'd.

SEQUENCE LISTING

<110> Schembri, Mark Andrew
Klemm, Per

<120> Novel multifunctional adhesin proteins and their display in microbial cells

<130> 21352 PC 1

<150> PA 1998 00598
<151> 1998-04-30
Prov PA 60/083,794
1998-05-01

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Met Lys Arg Val Ile Thr Leu Phe Ala Val Leu Leu Met Gly Trp Ser
 1               5                  10                  15
Val Asn Ala Trp Ser Phe Ala Cys Lys Thr Ala Asn Gly Thr Ala Ile
            20                  25                  30
Pro Ile Gly Gly Gly Ser Ala Asn Val Tyr Val Asn Leu Ala Pro Val
        35                  40                  45
Val Asn Val Gly Gln Asn Leu Val Val Asp Leu Ser Thr Gln Ile Phe
    50                  55                  60
Cys His Asn Asp Tyr Pro Glu Thr Ile Thr Asp Tyr Val Thr Leu Gln
65                  70                  75                  80
Arg Gly Ser Ala Tyr Gly Gly Val Leu Ser Asn Phe Ser Gly Thr Val
                85                  90                  95
Lys Tyr Ser Gly Ser Ser Tyr Pro Phe Pro Thr Thr Ser Glu Thr Pro
            100                 105                 110
Arg Val Val Tyr Asn Ser Arg Thr Asp Lys Pro Trp Pro Val Ala Leu
        115                 120                 125
Tyr Leu Thr Pro Val Ser Ser Ala Gly Gly Val Ala Ile Lys Ala Gly
    130                 135                 140
Ser Leu Ile Ala Val Leu Ile Leu Arg Gln Thr Asn Asn Tyr Asn Ser
145                 150                 155                 160
Asp Asp Phe Gln Phe Val Trp Asn Ile Tyr Ala Asn Asn Asp Val Val
                165                 170                 175
Val Pro Thr Gly Gly Cys Asp Val Ser Ala Arg Asp Val Thr Val Thr
            180                 185                 190
Leu Pro Asp Tyr Pro Gly Ser Val Pro Ile Pro Leu Thr Val Tyr Cys
        195                 200                 205
Ala Lys Ser Gln Asn Leu Gly Tyr Tyr Leu Ser Gly Thr His Ala Asp
    210                 215                 220
Ala Gly Asn Ser Ile Phe Thr Asn Thr Ala Ser Phe Ser Pro Ala Gln
225                 230                 235                 240
Gly Val Gly Val Gln Leu Thr Arg Asn Gly Thr Ile Ile Pro Ala Asn
                245                 250                 255
Asn Thr Val Ser Leu Gly Ala Val Gly Thr Ser Ala Val Ser Leu Gly
            260                 265                 270
Leu Thr Ala Asn Tyr Ala Arg Thr Gly Gly Gln Val Thr Ala Gly Asn
        275                 280                 285
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Val Gln Ser Ile Ile Gly Val Thr Phe Val Tyr Gln
290 295 300

<210> 2
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<220>
<221> BINDING
<222> 2..4
<223> Binding motif for binding metal oxides

<400> 2
His Xaa Xaa Xaa His Arg Ser
1 5

<210> 3
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<220>
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<222> 2..4
<223> Binding motif for binding metal oxides

<400> 3
Arg Xaa Xaa Xaa His Arg Ser
1 5

<210> 4
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<220>
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<222> 3..4
<223> Binding motif for binding metal oxides

<400> 4
Ser Lys Xaa Xaa His Arg Ser
1 5

<210> 5
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<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 5
Ser Arg Xaa Xaa His Arg Ser
1 5

<210> 6
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<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 6
Thr Lys Xaa Xaa His Arg Ser
1 5

<210> 7
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<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 7
Thr Arg Xaa Xaa His Arg Ser
1 5

<210> 8
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide for the construction of a double-stranded poly histidine segment (Example 1)

<400> 8
gatctcatca ccatcatcac catg 24

<210> 9
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Oligonucleotide for the construction of a double-stranded poly histidine segment (Example 1)

<400> 9
gatccatggt gatgatggtg atga 24

<210> 10
<211> 54
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<213> Artificial Sequence

<220>
<221> unsure
<222> 13..39
<223> v indicates equal molar amounts of A, C, and G;and n indicates equal molar amounts of A, C, T, G in template oligonucleotide

<400> 10
ggacgcagat ctvnnvnnvn nvnnvnnvnn vnnvnnvnna gatctagcac cagt 54

<210> 11
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<213> Artificial Sequence

<220>
<223> Primer oligonucleotide

<400> 11
actggtgcta gatct 15

<210> 12
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 12
Arg Ser Val Val Arg Pro Lys Ala Ala Thr Asn Arg Ser
1 5 10

<210> 13
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 13
Arg Ser Arg Ile Arg His Arg Leu Val Gly Gln Arg Ser
1 5 10

<210> 14
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 14
Arg Ser Val Lys Asp Gly Ser Ala Thr Ala Lys Arg Ser Val Ala Asn
1 5 10 15
Phe Glu Thr Pro Arg Val Arg Ser
20

<210> 15
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 15
Arg Ser Ala Pro Gln Thr Gly Arg Pro Asn Asn Arg Ser Leu Pro Leu
1 5 10 15
Gly Asn Arg Asp Met Gln Arg Ser
20

<210> 16
<211> 13
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<220>
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<400> 16
Arg Ser Val Gln Asn Asp Arg Ile Val Ala Gly Arg Ser
1 5 10

<210> 17
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 17
Arg Ser Tyr Pro Pro Phe His Asn Asn Asp His Arg Ser
1 5 10

<210> 18
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 18
Arg Ser Asn Thr Arg Met Thr Ala Arg Gln His Arg Ser Ala Asn His
1 5 10 15
Lys Ser Thr Gln Arg Ala Arg Ser
20

<210> 19
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 19

Arg Ser Leu Ala Ile Asp Gly Thr Asp Val Gln Arg Ser Lys Pro Leu
1 5 10 15
Ala Arg Ser Ser Gly Ala Arg Ser
20

<210> 20
<211> 35
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 20
Arg Ser Pro Ser Pro Ile Arg Val Pro His His Arg Ser Thr Ala Ile
1 5 10 15
Pro Asn Arg Gln Leu Ile Arg Ser Gln Ile Arg Ile His Ala Met Gly
20 25 30
His Arg Ser
35

<210> 21
<211> 35
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 21
Arg Ser Arg Arg Val Arg Asp Ile His Leu Gly Arg Ser Val Gln His
1 5 10 15
Arg Leu Gly Gln Pro Leu Arg Ser Leu His Gln Gln Ser Ser Pro Thr
20 25 30
Leu Arg Ser
35

<210> 22
<211> 46
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 22
Arg Ser Arg Thr Pro Leu Ala Pro Val Pro Val Arg Ser Trp His Ile
1 5 10 15
Gly Ser Arg Thr Ile Ala Arg Ser Phe Asn Gly Ile Thr Ile Gly Asp
20 25 30
Asn Arg Ser Tyr Ile Pro Glu His Trp Tyr Trp Ser Arg Ser
35 40 45

<210> 23
<211> 13
<212> PRT
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<220>
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<400> 23
Arg Ser Gly Arg Met Gln Arg Arg Val Ala His Arg Ser
1 5 10

<210> 24
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 24
Arg Ser Leu Gly Lys Asp Arg Pro His Phe His Arg Ser
1 5 10

<210> 25
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 25
Arg Ser Arg Gly Leu Arg Asn Ile Leu Met Leu Arg Ser Tyr Asp Ser
1 5 10 15
Arg Ser Met Arg Pro His Arg Ser
20

<210> 26
<211> 24
<212> PRT
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<220>
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<400> 26
Arg Ser Glu Pro Arg Arg Ala Thr Gln Ala Pro Arg Ser Lys Pro Gln
1 5 10 15
Lys Asn Glu Pro Ala Pro Arg Ser
20

<210> 27
<211> 35
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<220>
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<400> 27

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Arg Ser Leu Gly Ala Val Ser Ser Leu Phe Ser Arg Ser Gln Lys Ile
 1               5                  10                  15
Met Gln Thr Asp Ile Val Arg Ser Lys Gly Val Arg Pro Gly Ala Gln
            20                  25                  30
Arg Arg Ser
        35
```

<210> 28
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 28

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Arg Ser His His Met Leu Arg Arg Arg Asn Thr Arg Ser
 1               5                  10
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<210> 29
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 29

```
Arg Ser His Ile Asn Ala Ser Gln Arg Val Ala Arg Ser
 1               5                  10
```

<210> 30
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 30

```
Arg Ser Cys Pro Arg Leu Gly Val Trp Phe Tyr Arg Ser Leu Ser Val
 1               5                  10                  15
Gly Asp Gly Phe Val Arg Arg Ser
            20
```

<210> 31
<211> 35
<212> PRT
<213> Artficial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 31

```
Arg Ser Thr Ser Gly Pro Ser Arg Val Met Thr Arg Ser Ile Ile Leu
 1               5                  10                  15
Arg Ile Gly Thr Leu Asp Arg Ser Cys Leu Lys Val Phe His Met Gly
```

20 25 30
Trp Arg Ser
35

<210> 32
<211> 35
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to metal oxides

<400> 32
Arg Ser Ile Thr Pro Ile Leu His Asp His Arg Arg Ser Ser Val Arg
1 5 10 15
Pro Met Val Ala His Arg Arg Ser Pro Thr Leu Tyr Phe Pro Ala Ala
20 25 30
Ser Arg Ser
35

<210> 33
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 33
Ser Lys Xaa Xaa Ala Arg
1 5

<210> 34
<211> 6
<212> PRT
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<220>
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<222> 3..4
<223> Binding motif for binding metal oxides
<400> 34
Ser Arg Xaa Xaa Ala Arg
1 5

<210> 35
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 35
Thr Lys Xaa Xaa Ala Arg
1 5

<210> 36
<211> 6
<212> PRT
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<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 36
Thr Arg Xaa Xaa Ala Arg
1 5

<210> 37
<211> 7
<212> PRT
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<220>
<221> BINDING
<222> 3..4
<223> Binding motif for binding metal oxides

<400> 37
Arg Xaa Xaa Xaa His Arg Ser
1 5

<210> 38
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 38
Arg Ser Asn Thr Arg Met Thr Ala Arg Gln His Arg Ser Ala Asn His
1 5 10 15
Lys Ser Thr Gln Arg Ala Arg Ser
20

<210> 39
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 39
Arg Ser Val Phe Leu Pro Ser Ile Leu Gly Trp Arg Ser Arg Leu Asp
1 5 10 15
Asp Gln Gly Val Ala Ala Arg Ser
20

<210> 40
<211> 24

<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 40
Arg Ser Thr Arg Asn Lys His Thr Thr Ala Arg Arg Ser Val Ala Pro
1 5 10 15
Gly Ile Gly Glu Pro Ser Arg Ser
20

<210> 41
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 41
Arg Ser Ile Met His Val Arg Leu Arg Ala Arg Arg Ser Ala Arg His
1 5 10 15
Met Lys Asp Ala Asp Pro Arg Ser
20

<210> 42
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 42
Arg Ser Pro Ile Ile Ile Arg Ser Arg Ile Asn Arg Ser His Gly Arg
1 5 10 15
Thr Lys Ala Thr Pro Ala Arg Ser
20

<210> 43
<211> 24
<212> PRT
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<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 43
Arg Ser Arg Gly Leu Arg Asn Ile Leu Met Leu Arg Ser Tyr Asp Ser
1 5 10 15
Arg Ser Met Arg Pro His Arg Ser
20

<210> 44
<211> 13
<212> PRT

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<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 44
Arg Ser Thr Arg Arg Gly Thr His Asn Lys Asp Arg Ser
1 5 10

<210> 45
<211> 14
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 45
Arg Ser Thr Val Pro Lys Lys Arg His Pro Lys Asp Arg Ser
1 5 10

<210> 46
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Sequence conferring the ability of cells to adhere to ZnO

<400> 46
Arg Ser Tyr Asp Ser Arg Ser Met Arg Pro His Arg Ser
1 5 10